Name: _____

Grade:	A	M	E
Section total:			

Sacred Heart College

2

SCIENCE

September 2009

Level 2

2.5 (90767) Describe the geological history of New Zealand

Preliminary Examination for
External Achievement Standard worth 3 credits in the November examination,

You should answer ALL the questions in this booklet.

If you need more space for any answer, use the blank pages provided at the back of the booklet and clearly number the question.

Check that this booklet has pages xxxx in the correct order and that none of these pages is blank.
YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only

AS 90766 Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Describe New Zealand's geological history. ☐	Explain New Zealand's geological history. ☐	Discuss New Zealand's geological history. ☐
Overall level of achievement (all columns in a criteria are met): ☐		

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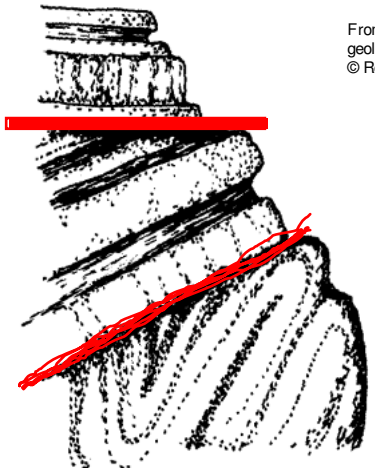
Question One: Geological ideas and processes

1. The diagram to the right shows a set of rock strata containing at least one unconformity. Indicate clearly on the diagram where any **unconformities** in this section occur.



From: Field guide to NZ geology, by J Thornton
© Reed books 1985

2. Explain the sequence of events that might lead to an unconformity such as is in the illustration.

Bottom layer formed, folded, uplifted, peneplained off. Tilted layers laid down, uplifte, tilted, planed off. Top layers formed

3. Discuss the evidence in the illustration that these rocks have been subjected to at least one orogeny. Relate the evidence to any orogenic processes you describe.

Folding of bottom layer
Tilting of next layers
Two unconformities with angles between them imply uplift and deformation, associated with orogeny

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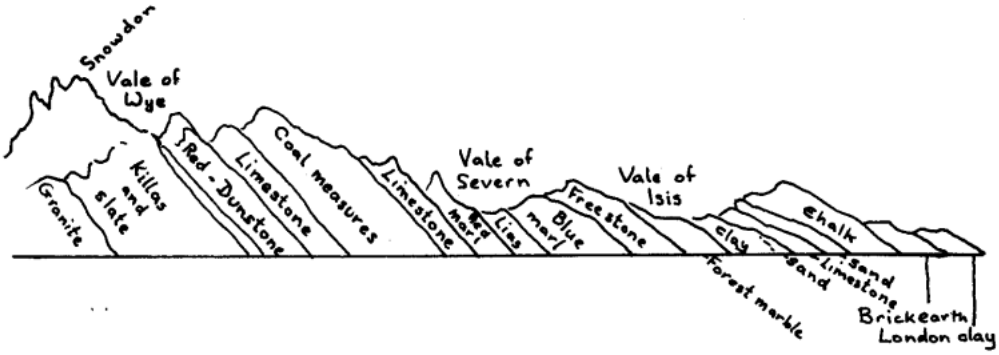
4. The sequence of strata below is a cross section developed by British engineer William Smith in the early 1800s. He was one of the first to recognize the age relationships in the strata he mapped.



From: Field guide to NZ geology, by J Thornton © Reed books 1985

a. Name the **youngest** rock formation in this sequence

London clay

The diagram to the right shows how a sequence such as that above could form at the edge of a continent.

From: Field guide to NZ geology, by J Thornton © Reed books 1985

b. Discuss how the age relationships shown in the diagram above could be caused by the process shown in the diagram.

New sediments laid down on right of diagram by erosion from land.
Then pushed up onto land by collision shown (subduction)
Process repeats, over and over
Results in sequence of sediments with youngest at right, oldest at left

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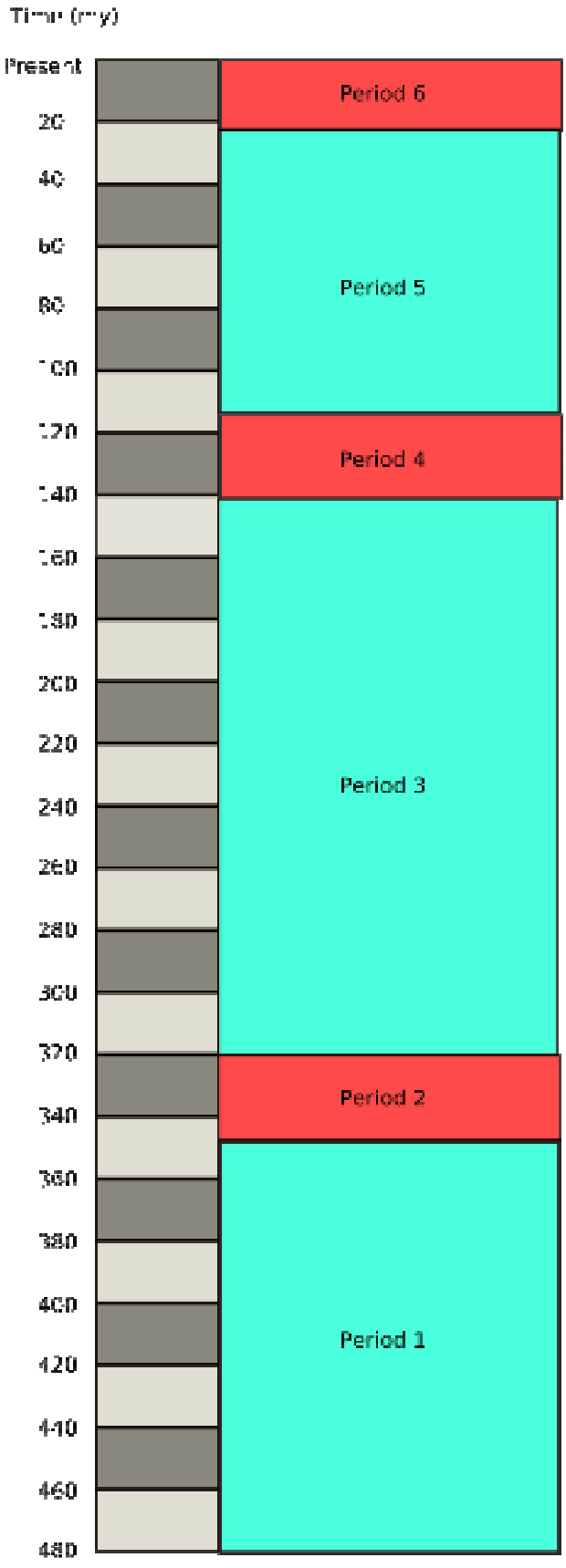
Question Two: Processes over geological time



New Zealand's geological history can be divided into six periods, shown in the diagram on the left.
Processes that occurred during these periods include:
· uplift, · erosion, · deposition, · volcanism,
· intrusion, · metamorphism, · peneplanation
· marine transgression

The periods can be divided into two groups: orogenic periods and non-orogenic periods.

1. Complete the tables below to show which periods (1 – 6) were orogenic periods (orogenies) and which were not. For each, write the main processes that occurred at this time

Orogenic periods:

Which periods on diagram (numbers)	
	2, 4, 6
Main processes:	
	Uplift, volcanism, intrusion, metamorphism

Non-orogenic periods (between orogenies)

Which periods on diagram:	
	1, 3, 5
Main processes:	
	Peneplanation, marine transgression, erosion, deposition

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There are two main types of dating used by geologists that could be used to find out the age of a newly discovered rock formation or unit.

- by using radioactive minerals (radiometric dating)
- by using fossils

Each method applies to particular sorts of rocks. Explain which sort would best apply to –

a. sedimentary rocks

Type of dating: Fossils

Reason for this being more suitable:

Fossils are found in sedimentary rocks, as the remains of living things contribute sediment
Minerals in sedimentary rocks would give the age of the sediment source, not the age of the rock

b. igneous rocks (volcanic or intrusive) radiometric

Reason for this being more suitable:

Fossils are never found in igneous rocks
Radioactive minerals are formed when the rock forms, so are the same age as the rock

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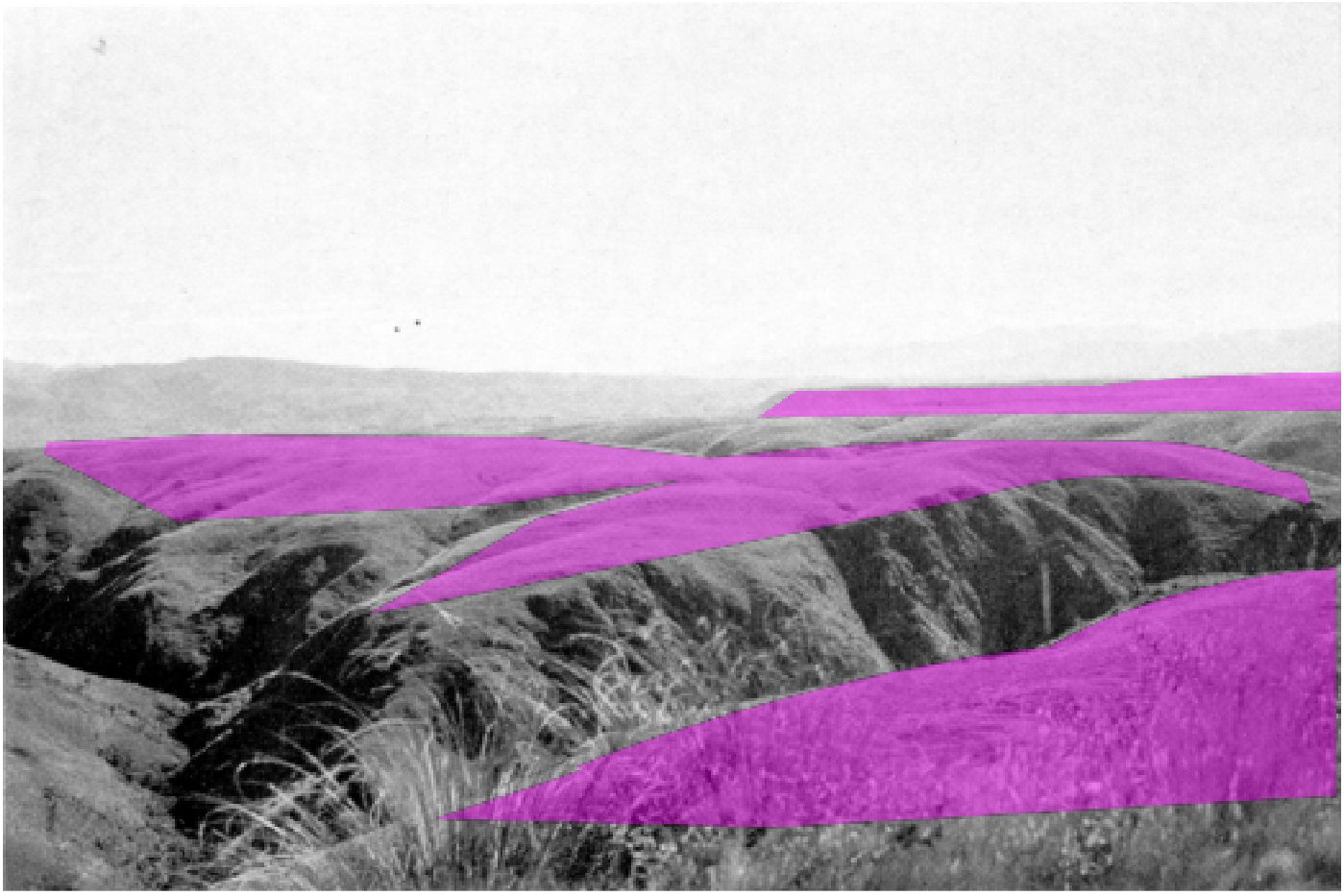
Question Three: Peneplanation

Central Otago is considered by some geologists to be the remains of a **peneplain**, formed after the end of the Rangitata Orogeny .



Awamoko stream dissecting a late Cretaceous peneplain, North Otago.

From: Gage, Maxwell: Legends in the rocks. Whitcoulls, 1980

1. Describe what occurs during a period of peneplanation

The landscape is worn down to a fairly level surface by erosion

2. Use features from this photograph to explain why geologists consider this area to be a peneplain. You may draw on the picture to illustrate your points.

There is a high level surface (shaded) which has been cut through by later erosion to form the streams, which indicates that the level area is older than the valleys.

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Question 4: Limestone

After the peneplanation, limestones were laid down over much of New Zealand. These include the famous limestones of Punakaiki, illustrated on right,

The presence of these limestones is thought to indicate that New Zealand had little or no land area at this time.

a. From what type of material is limestone formed?

Seashells/calcite/calcium carbonate

Explain why limestone deposits always indicate marine (sea) deposition.

Because limestone forming organisms are always marine

c. Discuss why limestone (as opposed to other marine sedimentary rocks such as turbidity current deposits) might indicate a lack of land area.

Shells are found in the sea most of the time.
However, they normally only form a minor component of sediment.
If there is a lack of land area, then the sea is 'sediment starved'
This means that shells will then form the majority of the sediment, making limestone.

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